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Pasquero et al.

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(54) **IN-CONTEXT WORD PREDICTION AND WORD CORRECTION**

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G06F 3/0488	(2013.01)
G06N 99/00	(2010.01)
G06F 17/27	(2006.01)
G06F 3/023	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 3/04886*** (2013.01); ***G06F 3/0237*** (2013.01); ***G06F 17/276*** (2013.01); ***G06N 99/005*** (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,953,541	A *	9/1999	King et al.	710/67
6,008,799	A	12/1999	Van Kleeck	
6,286,064	B1 *	9/2001	King et al.	710/67
6,307,548	B1 *	10/2001	Flinchem et al.	715/811
6,636,162	B1 *	10/2003	Kushler et al.	341/28
6,646,573	B1 *	11/2003	Kushler et al.	341/28
6,801,190	B1 *	10/2004	Robinson et al.	345/173
7,088,345	B2 *	8/2006	Robinson et al.	345/173
7,098,896	B2 *	8/2006	Kushler et al.	345/168
7,277,088	B2 *	10/2007	Robinson et al.	345/173
7,443,316	B2	10/2008	Lim	
7,453,439	B1 *	11/2008	Kushler et al.	345/168
7,479,949	B2 *	1/2009	Jobs et al.	345/173
7,593,605	B2 *	9/2009	King et al.	382/313
7,758,264	B2 *	7/2010	Jawerth et al.	400/489
7,812,860	B2 *	10/2010	King et al.	348/210.99
7,880,730	B2 *	2/2011	Robinson et al.	345/173

(Continued)

FOREIGN PATENT DOCUMENTS

EP	1320023	6/2003
WO	2008/085737	7/2008

OTHER PUBLICATIONS

Arnab et al., "Effective Phrase Prediction", Proceeding, VLDB '07 Proceedings of the 33rd international conference on Very large data bases, pp. 219-230, 2007.*

(Continued)

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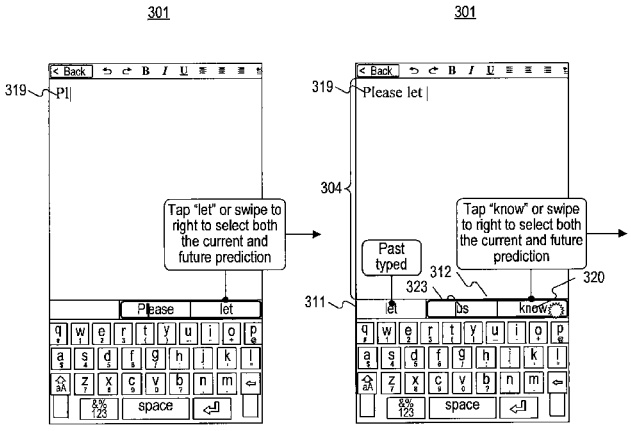
(57) **ABSTRACT**

Methods and systems for predicting user input on a keyboard. Methods include enabling user input on a display comprising at least three fields. The first field displays an input string that is based on input selections such as keyboard entries. The second field displays a candidate prediction generated based on other input selections, consisting at least in part of a proposed completion to the input selection, and partially based on the input string in the first field. The third field displays another candidate prediction generated based on the input string in the first field as well as the candidate prediction in the second field.

28 Claims, 13 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

7,912,700	B2	3/2011	Bower et al.	
8,028,230	B2	9/2011	Hong	
8,074,172	B2	12/2011	Kocienda et al.	
8,232,973	B2 *	7/2012	Kocienda et al.	345/173
2004/0021691	A1	2/2004	Dostie et al.	
2004/0140956	A1 *	7/2004	Kushler et al.	345/168
2004/0155869	A1 *	8/2004	Robinson et al.	345/168
2005/0174333	A1 *	8/2005	Robinson et al.	345/168
2006/0029296	A1 *	2/2006	King et al.	382/313
2006/0098899	A1 *	5/2006	King et al.	382/305
2006/0159507	A1 *	7/2006	Jawerth et al.	400/472
2006/0195320	A1 *	8/2006	Carpenter	704/243
2006/0265648	A1	11/2006	Rainisto et al.	
2006/0265668	A1	11/2006	Rainisto	
2007/0256029	A1 *	11/2007	Maxwell	715/834
2008/0100579	A1 *	5/2008	Robinson et al.	345/168
2008/0122796	A1	5/2008	Jobs et al.	
2008/0182599	A1	7/2008	Rainisto et al.	
2008/0285857	A1 *	11/2008	Sharan et al.	382/209
2008/0300853	A1 *	12/2008	Xiaoning	704/2
2009/0077464	A1	3/2009	Goldsmith et al.	
2009/0174667	A1 *	7/2009	Kocienda et al.	345/169
2009/0198691	A1	8/2009	Kraft et al.	
2009/0228825	A1 *	9/2009	Van Os et al.	715/780
2010/0161538	A1	6/2010	Kennedy et al.	
2010/0183246	A1 *	7/2010	King et al.	382/305
2010/0265181	A1	10/2010	Shore	
2011/0006929	A1 *	1/2011	Fux et al.	341/24
2011/0078563	A1 *	3/2011	Archer	715/261
2011/0085211	A1 *	4/2011	King et al.	358/474
2011/0090151	A1	4/2011	Huang et al.	
2011/0201387	A1 *	8/2011	Paek et al.	455/566
2012/0254318	A1 *	10/2012	Poniatowskl	709/206
2012/0326984	A1 *	12/2012	Ghassabian	345/168
2013/0125037	A1 *	5/2013	Pasquero et al.	715/773
2013/0246329	A1 *	9/2013	Pasquero et al.	706/52
2013/0271385	A1 *	10/2013	Griffin et al.	345/173
2013/0285926	A1 *	10/2013	Griffin et al.	345/173
2013/0325438	A1 *	12/2013	Griffin et al.	704/9
2014/0104251	A1 *	4/2014	Zhang	345/205

OTHER PUBLICATIONS

Partial European Search Report in corresponding European Patent Application No. EP 12 15 9905, mailed Jul. 25, 2012.

Article 94(3) Communication from the European Patent Office of Application No. 12 159 905.4, mailed Jun. 18, 2014, from the European Patent Office (7 pages).

Extended European Search Report issued in EP Application No. 12159905.4, mailed Nov. 26, 2012, 8 pages.

Replacement Search Report issued in EP Application No. 12159905.4, mailed Dec. 21, 2012, 5 pages.

Canadian Office Action issued in CA Application No. 2,809,653, mailed Sep. 29, 2014, 3 pages.

* cited by examiner

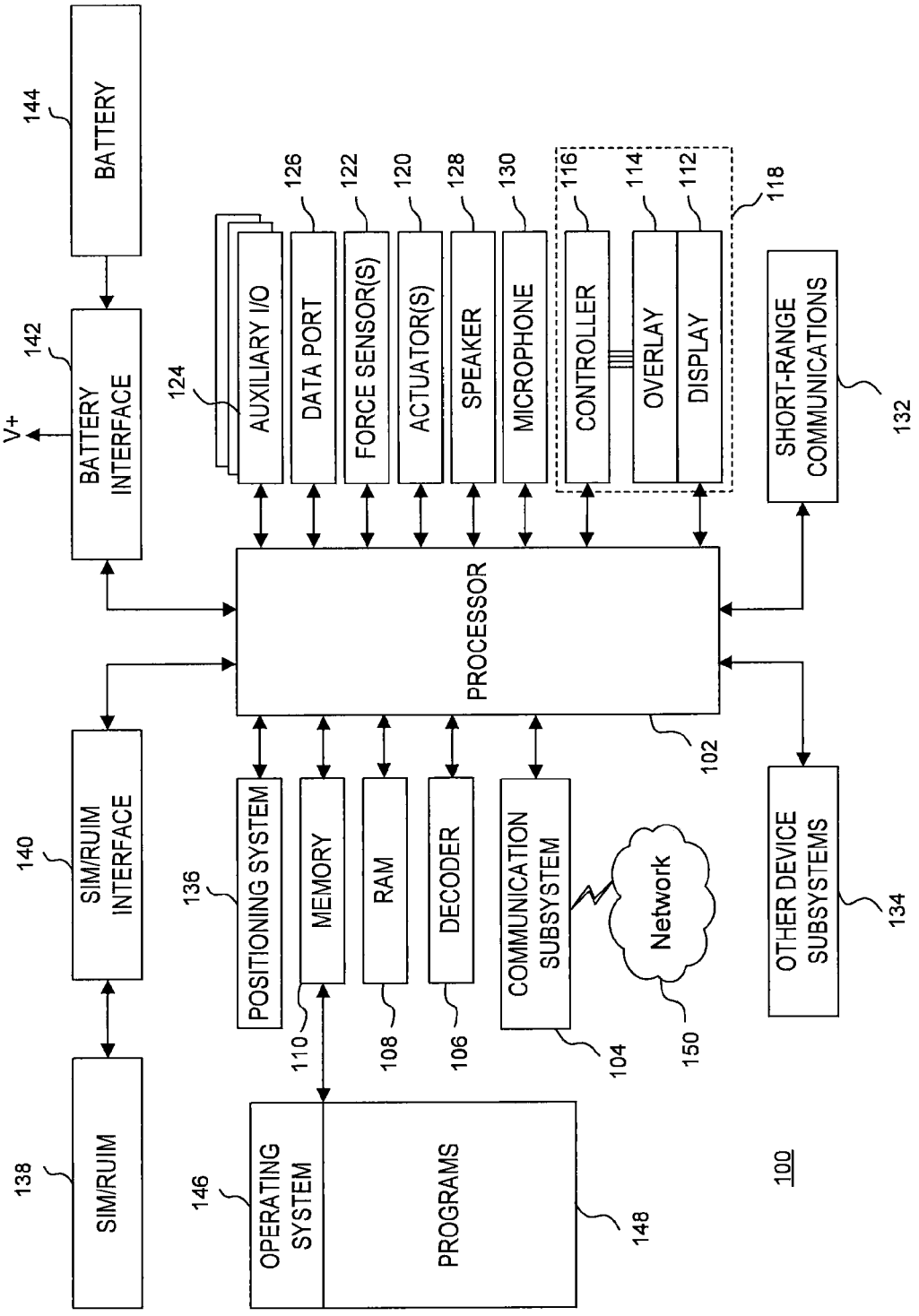

BATTERY
144
BATTERY INTERFACE
142
V+
124
AUXILIARY I/O
126
DATA PORT
122
FORCE SENSOR(S)
120
ACTUATOR(S)
128
SPEAKER
130
MICROPHONE
116
CONTROLLER
114
OVERLAY
112
DISPLAY
118
SHORT-RANGE COMMUNICATIONS
132
PROCESSOR
102
SIM/RUIM INTERFACE
140
SIM/RUIM
138
POSITIONING SYSTEM
136
MEMORY
110
RAM
108
DECODER
106
COMMUNICATION SUBSYSTEM
104
Network
150
OTHER DEVICE SUBSYSTEMS
134
OPERATING SYSTEM
146
PROGRAMS
148
100

FIG. 1

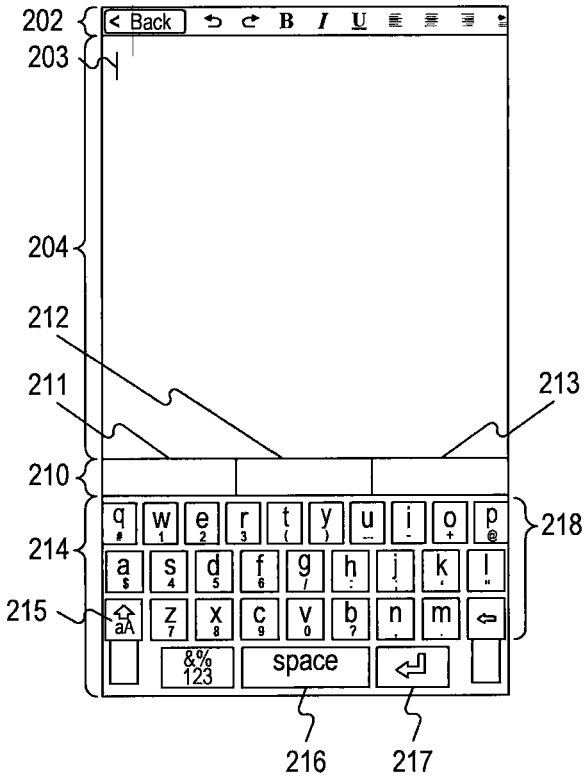


FIG. 2

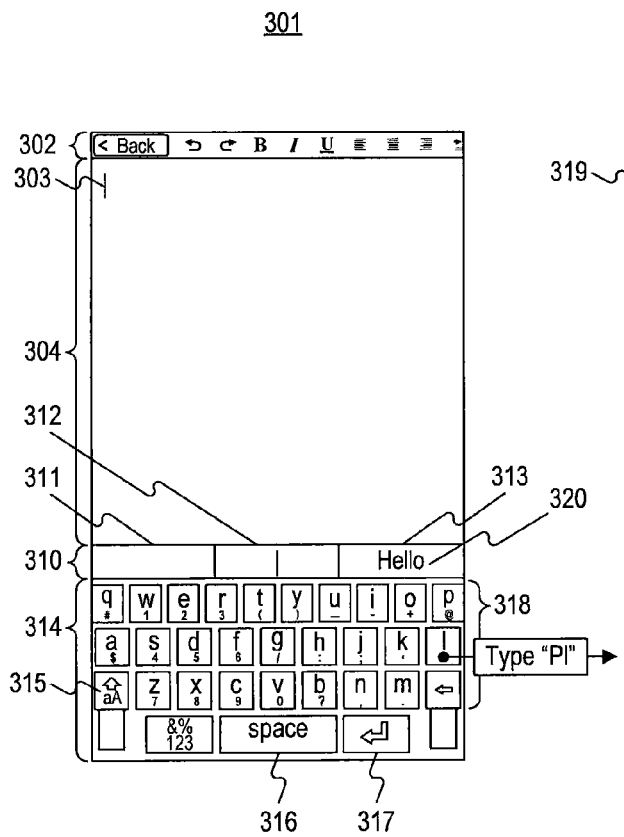

301
302
303
304
312
311
313
320
310
Hello
318
314
315
Type "PI"
space
316
317

FIG. 3A

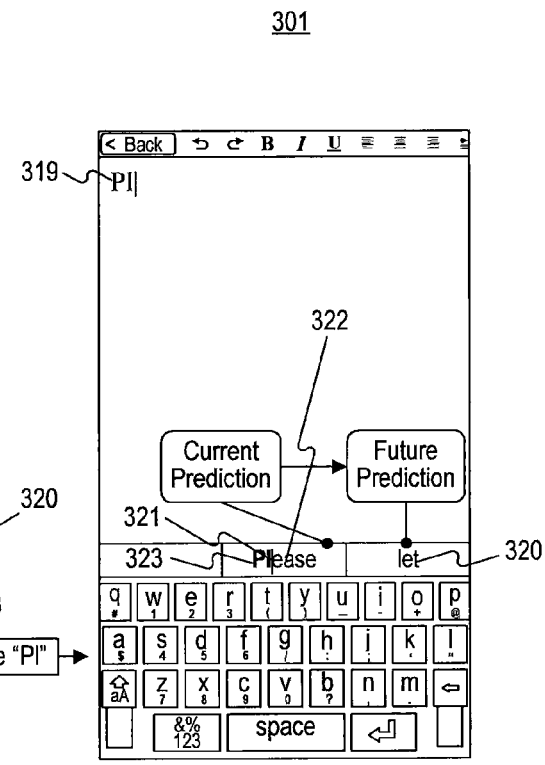

301
319
PI
322
Current Prediction
Future Prediction
321
323
Please
let
320
space

FIG. 3B

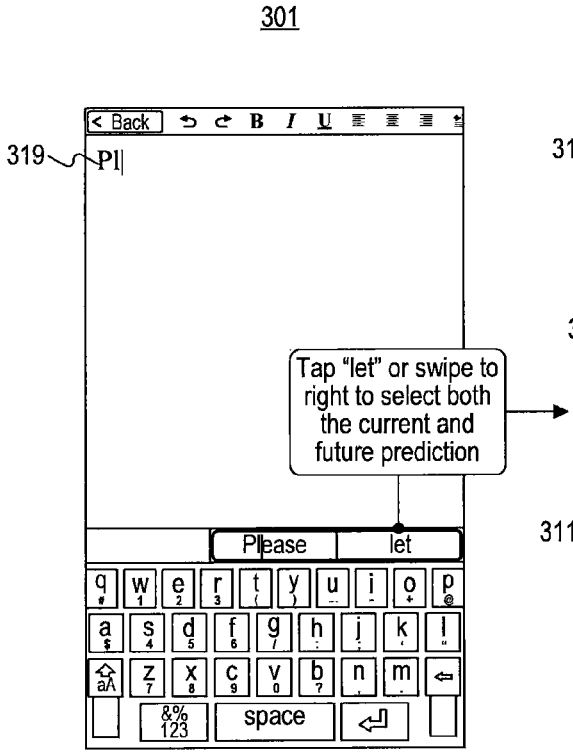

301
319
Pl
Tap "let" or swipe to right to select both the current and future prediction
Please
let

FIG. 3C

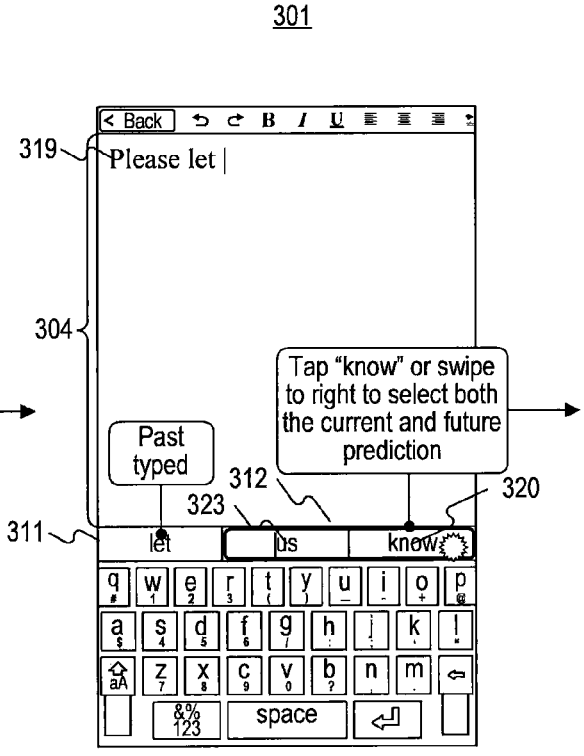

301
319
Please let
304
Tap "know" or swipe to right to select both the current and future prediction
Past typed
312
323
320
311
let
us
know
space

FIG. 3D

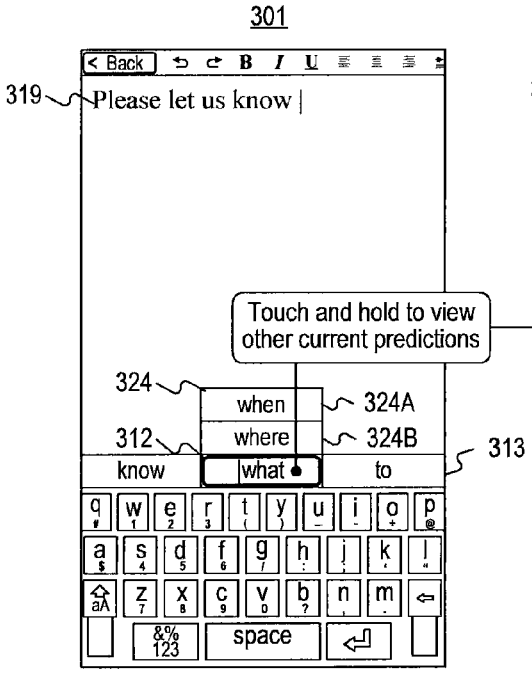


FIG. 3E

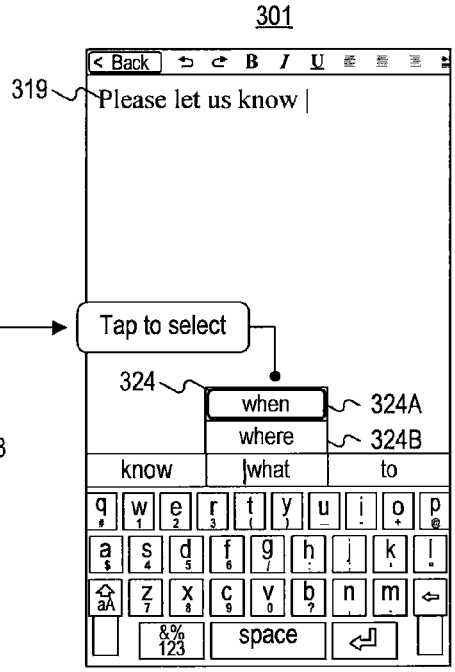


FIG. 3F

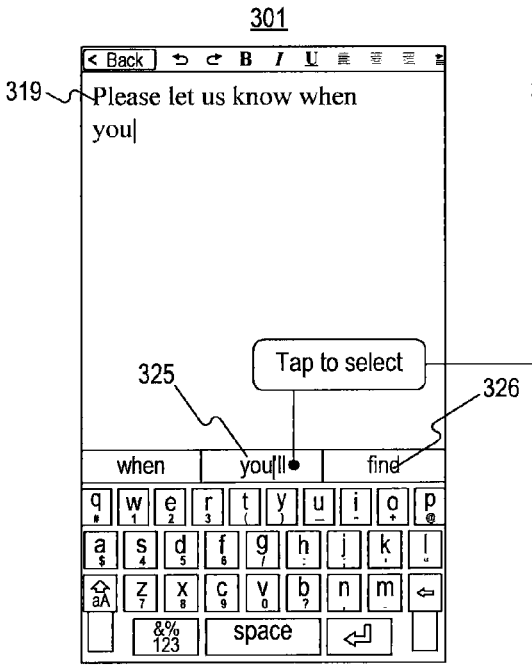


FIG. 3G

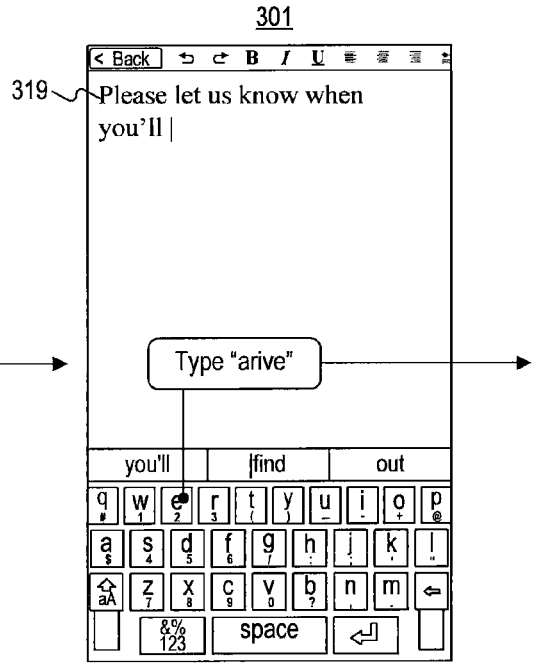


FIG. 3H

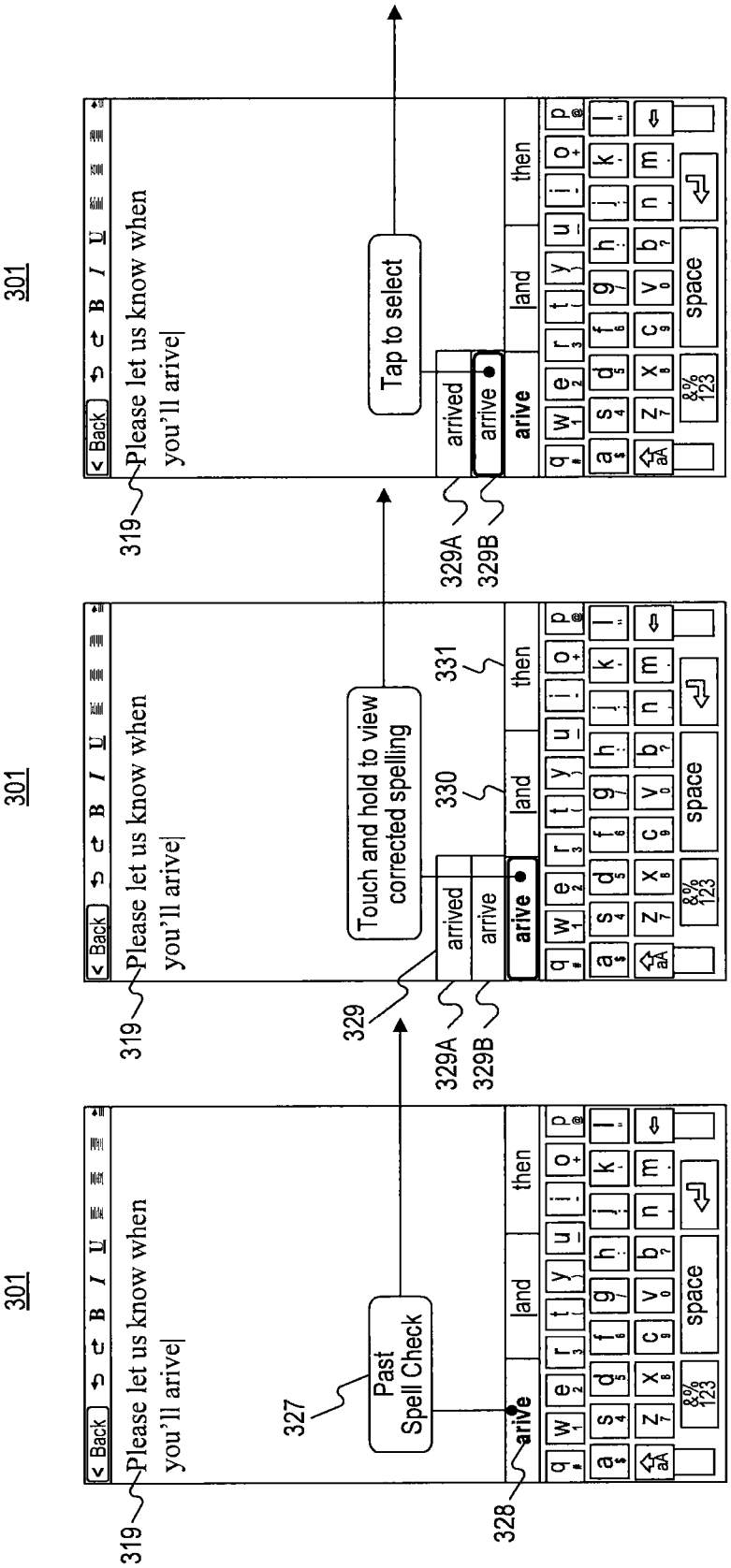


FIG. 3I

FIG. 3J

FIG. 3K

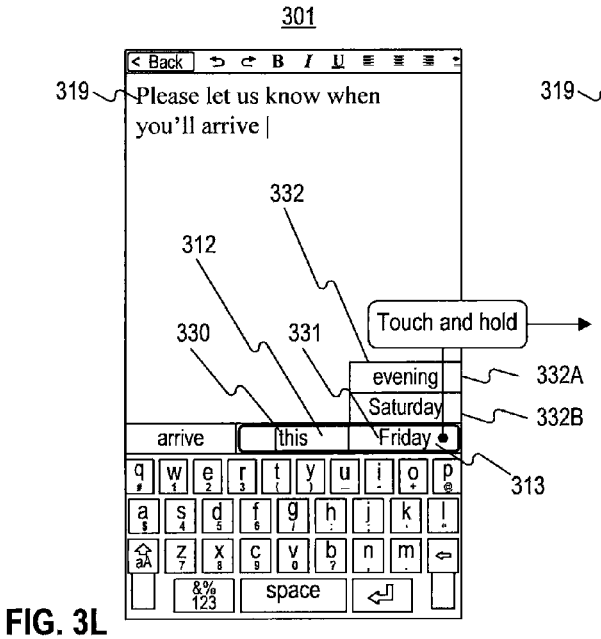


FIG. 3L

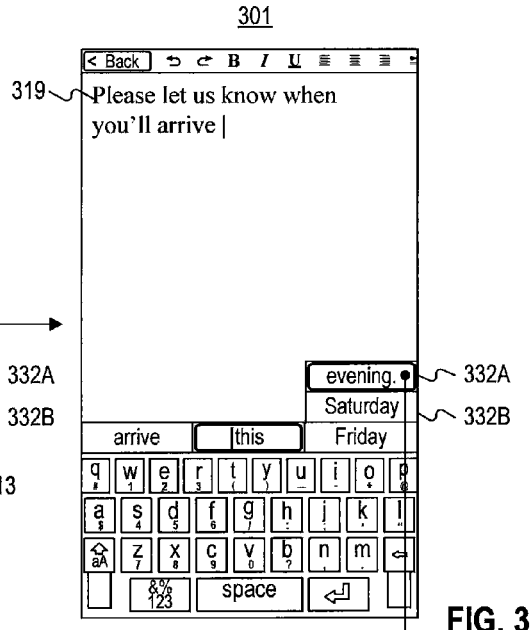


FIG. 3M

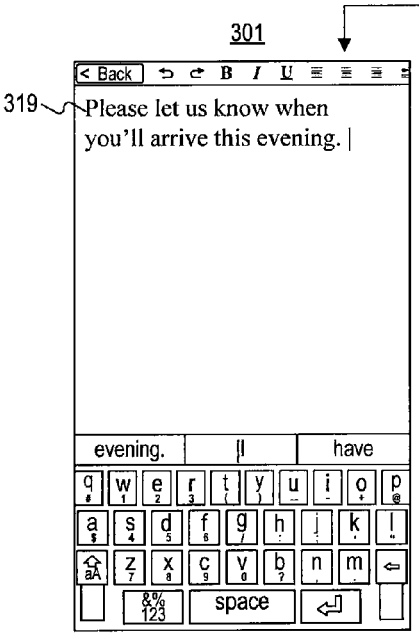


FIG. 3N

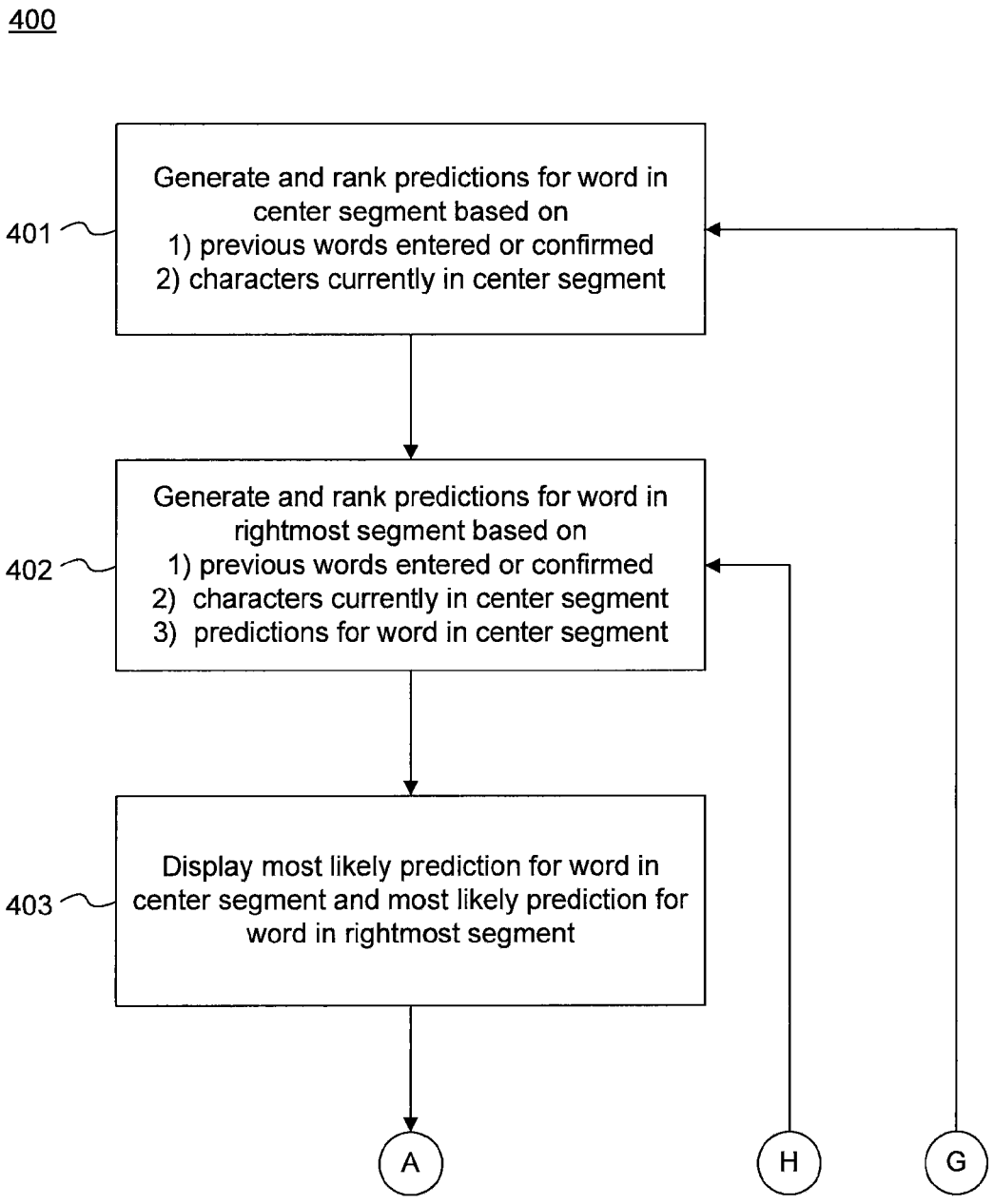

400
401
Generate and rank predictions for word in center segment based on
1) previous words entered or confirmed
2) characters currently in center segment
402
Generate and rank predictions for word in rightmost segment based on
1) previous words entered or confirmed
2) characters currently in center segment
3) predictions for word in center segment
403
Display most likely prediction for word in center segment and most likely prediction for word in rightmost segment
A
H
G

FIG. 4A

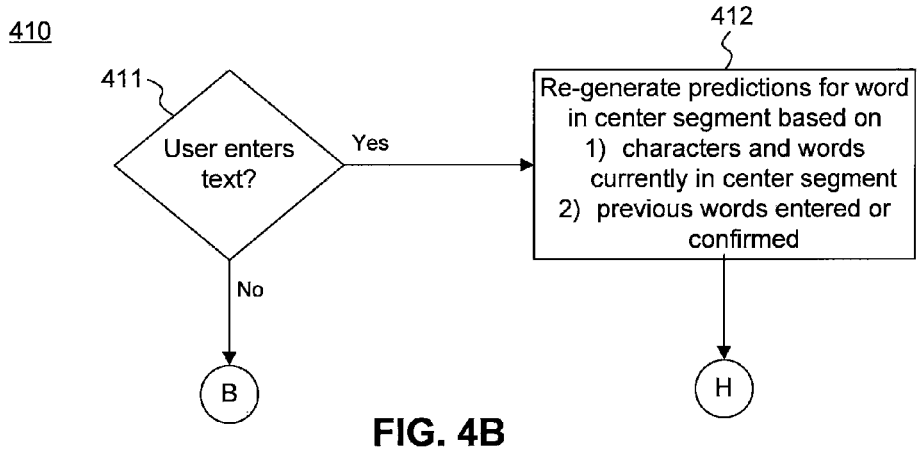

410
411
User enters text?
Yes
No
B
412
Re-generate predictions for word in center segment based on
1) characters and words currently in center segment
2) previous words entered or confirmed
H

FIG. 4B

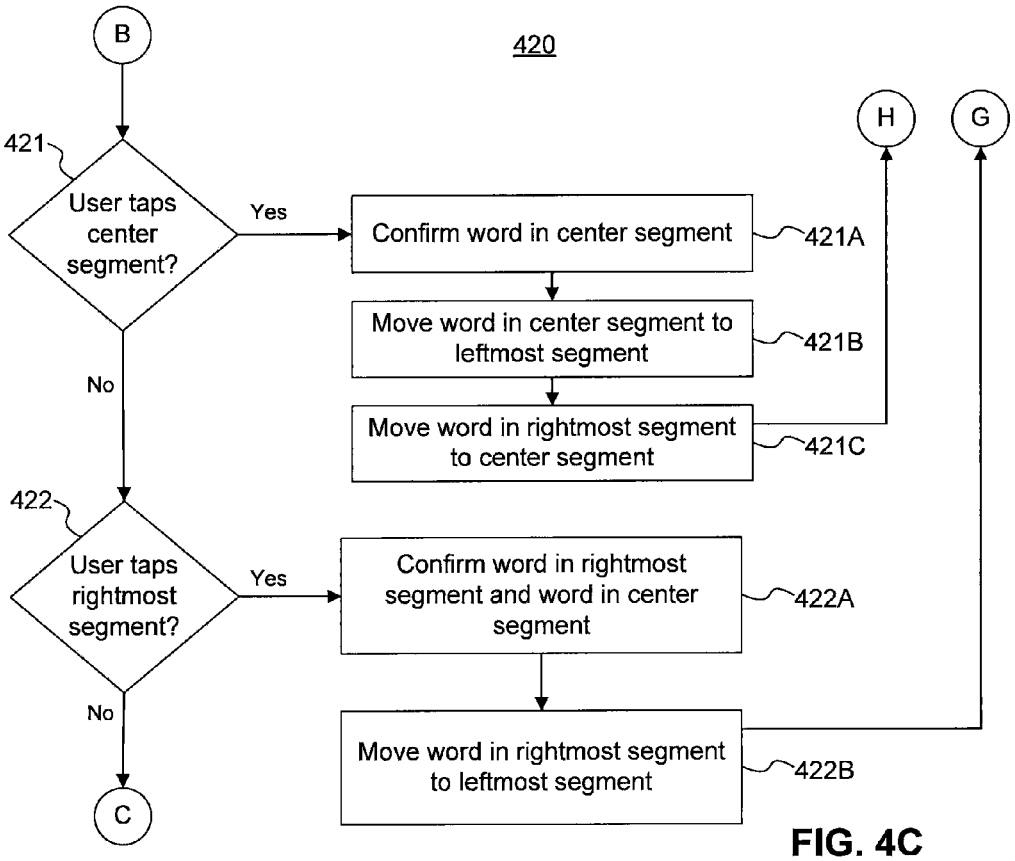

B
420
421
User taps center segment?
Yes
No
Confirm word in center segment
421A
Move word in center segment to leftmost segment
421B
Move word in rightmost segment to center segment
421C
H
G
422
User taps rightmost segment?
Yes
No
Confirm word in rightmost segment and word in center segment
422A
Move word in rightmost segment to leftmost segment
422B
C

FIG. 4C

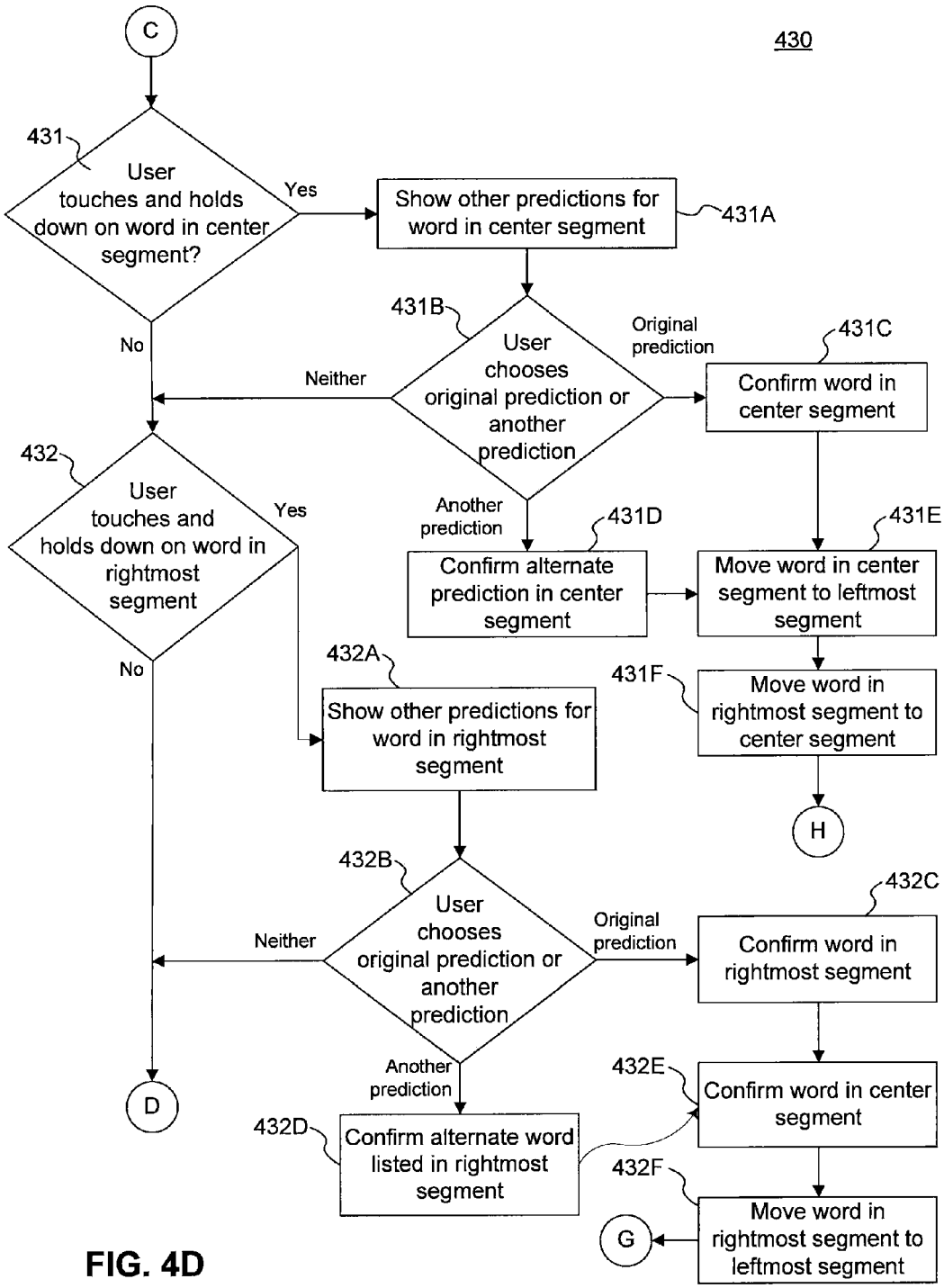

C
430
431
User touches and holds down on word in center segment?
Yes
Show other predictions for word in center segment
431A
No
431B
User chooses original prediction or another prediction
Original prediction
431C
Confirm word in center segment
Neither
432
User touches and holds down on word in rightmost segment
Yes
Another prediction
431D
Confirm alternate prediction in center segment
431E
Move word in center segment to leftmost segment
No
432A
Show other predictions for word in rightmost segment
431F
Move word in rightmost segment to center segment
H
432B
User chooses original prediction or another prediction
Neither
Original prediction
432C
Confirm word in rightmost segment
Another prediction
432E
Confirm word in center segment
D
432D
Confirm alternate word listed in rightmost segment
432F
Move word in rightmost segment to leftmost segment
G

FIG. 4D

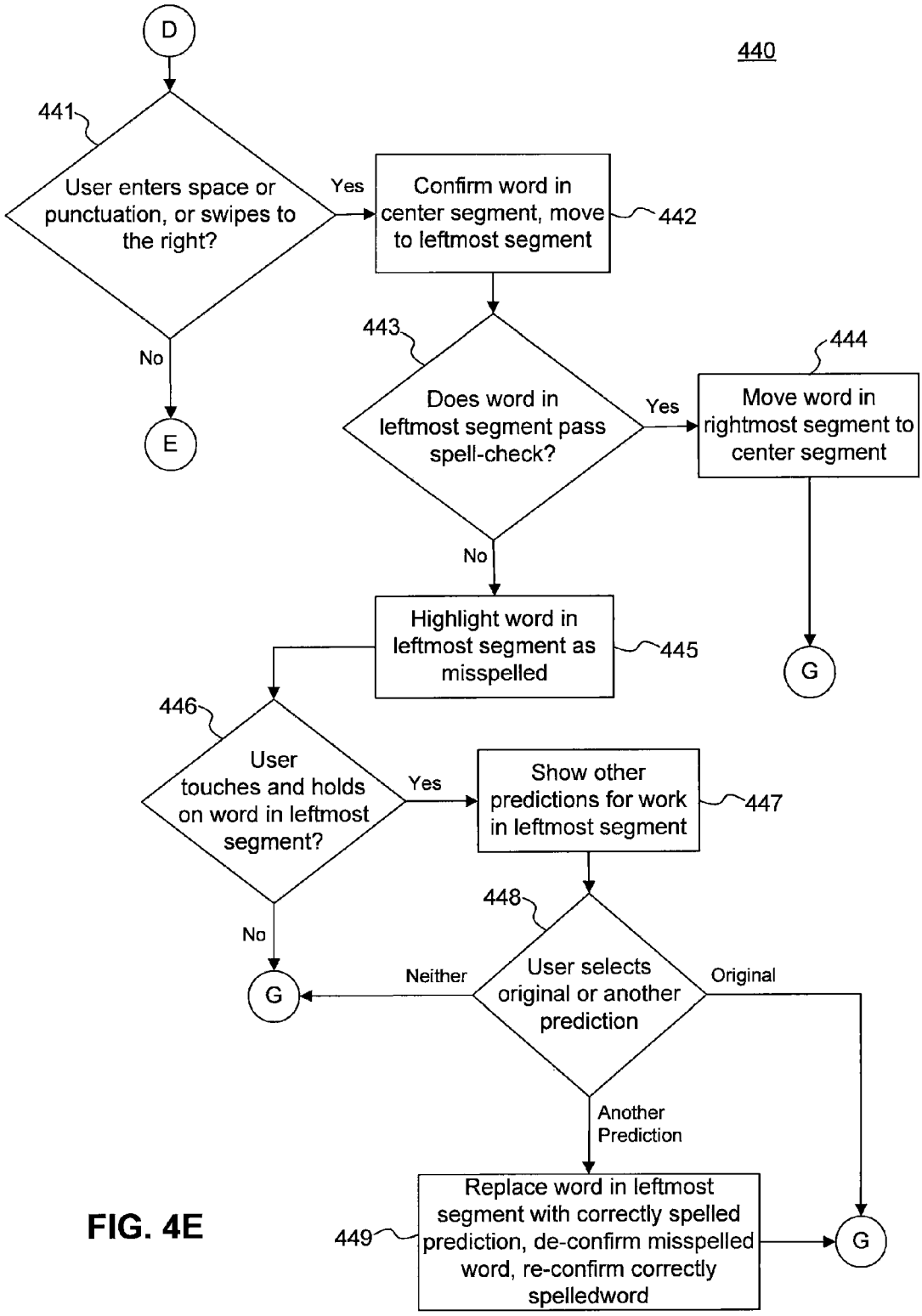

D
440
441
User enters space or punctuation, or swipes to the right?
Yes
Confirm word in center segment, move to leftmost segment
442
No
E
443
Does word in leftmost segment pass spell-check?
Yes
444
Move word in rightmost segment to center segment
No
Highlight word in leftmost segment as misspelled
445
G
446
User touches and holds on word in leftmost segment?
Yes
Show other predictions for work in leftmost segment
447
No
448
G
Neither
User selects original or another prediction
Original
Another Prediction
Replace word in leftmost segment with correctly spelled prediction, de-confirm misspelled word, re-confirm correctly spelledword
449
G

FIG. 4E

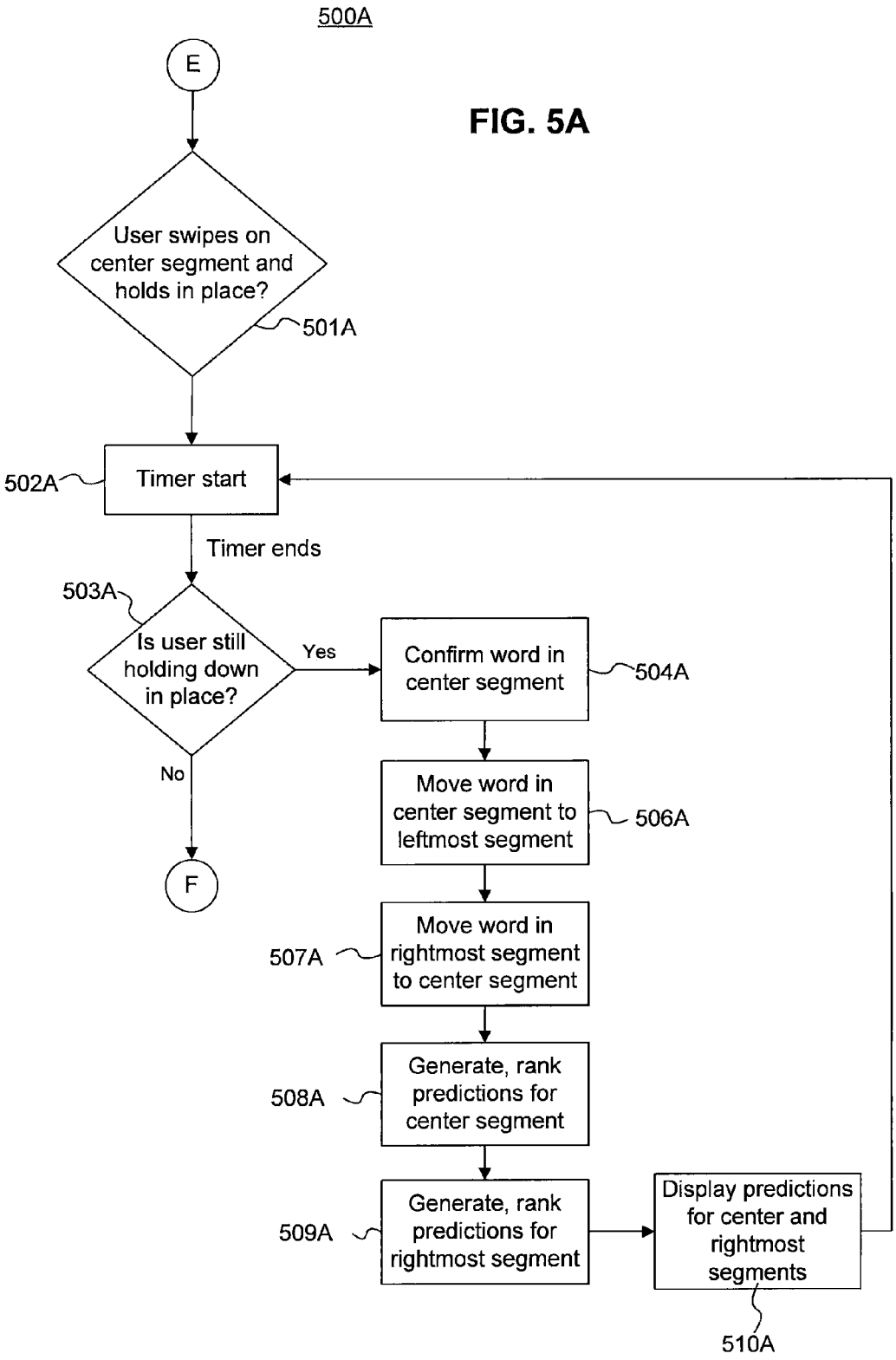

500A
E
User swipes on center segment and holds in place?
501A
502A
Timer start
Timer ends
503A
Is user still holding down in place?
Yes
No
Confirm word in center segment
504A
Move word in center segment to leftmost segment
506A
F
507A
Move word in rightmost segment to center segment
508A
Generate, rank predictions for center segment
509A
Generate, rank predictions for rightmost segment
Display predictions for center and rightmost segments
510A

FIG. 5A

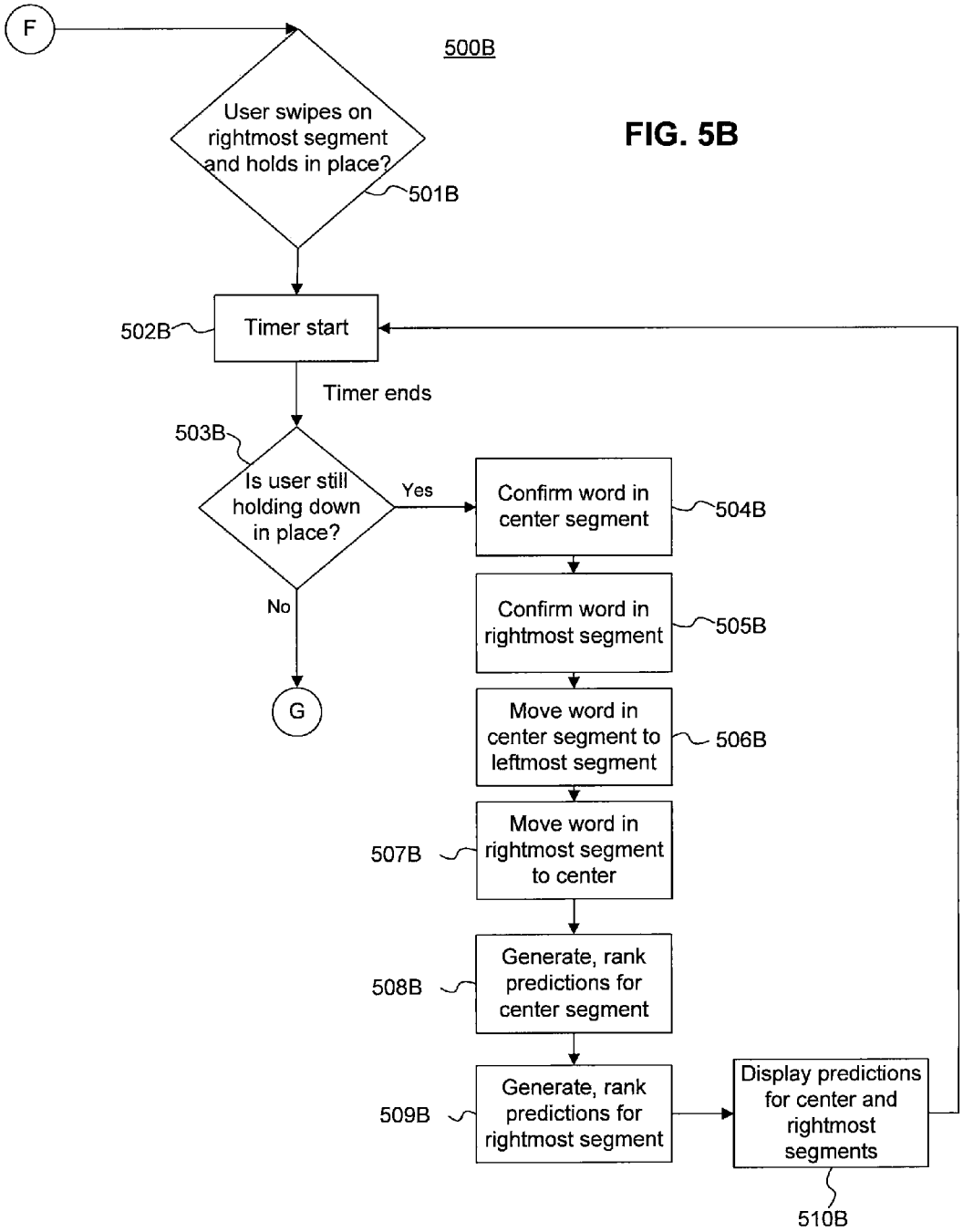

F
500B
User swipes on rightmost segment and holds in place?
501B
502B
Timer start
Timer ends
503B
Is user still holding down in place?
Yes
No
G
Confirm word in center segment
504B
Confirm word in rightmost segment
505B
Move word in center segment to leftmost segment
506B
507B
Move word in rightmost segment to center
508B
Generate, rank predictions for center segment
509B
Generate, rank predictions for rightmost segment
Display predictions for center and rightmost segments
510B

FIG. 5B

IN-CONTEXT WORD PREDICTION AND WORD CORRECTION

FIELD

Example embodiments disclosed herein relate generally to input methodologies for electronic devices, such as handheld electronic devices, and more particularly, to predictive text input methods for electronic devices.

BACKGROUND

Increasingly, electronic devices, such as computers, netbooks, cellular phones, smart phones, personal digital assistants, tablets, etc., have touchscreens that allow a user to input text characters into an application, such as a word processor or email application. Text input on touchscreens can be a cumbersome task due to, for example, the small touchscreen area. This is particularly frustrating where a user wishes to input a long message. Further, given the small touchscreen area, users have difficulty entering and selecting words.

Thus, a system is needed to intelligently allow a user to more quickly enter text on an electronic device, to yield an improved system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an example block diagram of an electronic device, consistent with embodiments disclosed herein.

FIG. **2** is an example diagram of a touchscreen as disposed in an electronic device, consistent with embodiments described herein.

FIGS. **3**A-**3**N show example screens of a touchscreen display, used to explain methods for accepting input from a user, consistent with embodiments disclosed herein.

FIG. **4**A is a flowchart illustrating an example portion of a method, consistent with embodiments disclosed herein.

FIG. **4**B is a flowchart illustrating an example portion of a method, consistent with embodiments disclosed herein.

FIG. **4**C is a flowchart illustrating an example portion of a method, consistent with embodiments disclosed herein.

FIG. **4**D is a flowchart illustrating an example portion of a method, consistent with embodiments disclosed herein.

FIG. **4**E is a flowchart illustrating an example portion of a method, consistent with embodiments disclosed herein.

FIG. **5**A is a flowchart illustrating an example portion of a method, consistent with embodiments disclosed herein.

FIG. **5**B is a flowchart illustrating an example portion of a method, consistent with embodiments disclosed herein.

DESCRIPTION OF EXAMPLE EMBODIMENTS

Reference will now be made in detail to various embodiments, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

The present disclosure relates to predictive text inputting processes for electronic devices such as (i) wired communication devices like laptop computers having touchscreens, (ii) wireless communication devices such as cellular phones, smartphones, wireless organizers, personal digital assistants, wirelessly enabled notebook computers, tablets, and similar devices, and (iii) independent electronic devices (without wireless or wired communication capabilities) such as a handheld electronic game device, digital photograph album, or digital camera. In some configurations, according to this disclosure, the electronic device comprises a virtual or physical keyboard or both types of keyboards.

Predictive text input solutions have been introduced for assisting with input on an electronic device. These solutions include predicting which word a user is entering and offering a suggestion for completing the word, and predicting future words that a user enters at a later time. But these solutions can have limitations, often requiring the user to input most or all of the characters in a text unit, such as a word, before the solution suggests the word the user is trying to input. Even then, a user often has to divert visual attention from the keyboard to view and consider the suggested word displayed elsewhere on the display of the electronic device, and thereafter, look back at the keyboard to continue typing. Refocusing of one's eyes relative to the keyboard while inputting information in an electronic device, particularly when composing large texts, can strain the eyes and be cumbersome, distracting, and otherwise inefficient. Moreover, processing cycles are lost and display power is wasted as the processor is idling while the user is focusing attention to the input area to determine what words or characters have been entered, and then back at the keyboard. A further limitation of these solutions is that they are only able to display predictions for the word the user is trying to input. These solutions also do not provide the necessary context for users to understand why a particular prediction has been chosen.

Accordingly, example embodiments described herein enable users of electronic devices to input information without diverting attention from the keyboard and subsequently refocusing, by making predictions about input units, such as words the user is currently entering and words the user is likely to enter at a later point, and allowing the user to select particular predictions or alternate predictions. These predictions are also referred to herein as candidate predictions for text units.

In one embodiment, a method is provided for accepting text input on an electronic device. The method enables user input using a set of fields on a display, and the display can include a first field displaying a first input string based on an input selection such as a user typing at a keyboard. The display further can include a second field displaying a first candidate prediction formed by a set of characters corresponding to input selections, such as a user typing at a keyboard, and a proposed completion; this proposed completion can be generated by a predictive algorithm using at least one of the first input string in the first field or the set of characters corresponding to input selections. The display can further include a third field displaying a second candidate prediction generated by a predictive algorithm using at least one of the first input string in the first field or the first candidate prediction.

In another embodiment, a second method is provided for accepting text input on an electronic device. The method displays a first candidate prediction on a touchscreen of the device; this prediction is based on an input selection (for example, text entry by a user). The method receives an initial touch input on top of the candidate prediction. While continuing to receive the initial touch input, the method receives a moving touch input on the touchscreen of the device and starts a timer. If the method determines that a continuous touch is still occurring on the touchscreen at the end of a period measured by the timer, the method will accept the first candidate prediction. This period measured by the time can be based in part on a distance between the position of the touch and an edge of the touchscreen.

In another embodiment, a device is provided. The device comprises a display and a processor that is configured to

perform a method. The method enables user input using a set of fields on a display, and the display can include a first field displaying a first input string based on an input selection such as a user typing at a keyboard. The display further can include a second field displaying a first candidate prediction formed by a set of characters corresponding to input selections, such as a user typing at a keyboard, and a proposed completion; this proposed completion can be generated by a predictive algorithm using at least one of the first input string in the first field or the set of characters corresponding to input selections. The display can further include a third field displaying a second candidate prediction generated by a predictive algorithm using at least one of the first input string in the first field or the first candidate prediction.

In another embodiment, a second device is provided for accepting text input on an electronic device. The device includes a display with a touchscreen and a processor configured to perform a method. The method performed by the processor displays a first candidate prediction on the touchscreen; this prediction is based on an input selection (for example, text entry by a user). The method receives an initial touch input on top of the candidate prediction. While continuing to receive the initial touch input, the method receives a moving touch input on the touchscreen of the device and starts a timer. If the method determines that a continuous touch is still occurring on the touchscreen at the end of a period measured by the timer, the method will accept the first candidate prediction. This period measured by the time can be based in part on a distance between the position of the touch and an edge of the touchscreen.

These example embodiments, as well as those described below, permit the user of an electronic device to input information without diverting visual attention from the keyboard and subsequently refocusing. Predicting and providing various options that the user is likely contemplating, and doing so at appropriate locations on the keyboard, allows a user's focus to remain on the keyboard, which enhances efficiency, accuracy, and speed of character input. Such embodiments allow users to select and confirm multiple words at the same time, thus creating a convenient system for use by its users.

FIG. **1** is a block diagram of a device **100**, consistent with example embodiments disclosed herein. Device **100** includes multiple components, such as a processor **102** that controls the overall operation of device **100**. Communication functions, including data and voice communications, are performed through a communication subsystem **104**. Data received by device **100** is decompressed and decrypted by a decoder **106**. Communication subsystem **104** receives messages from and sends messages to a network **150**. Network **150** can be any type of network, including, but not limited to, a wired network, a data wireless network, voice wireless network, and dual-mode wireless networks that support both voice and data communications over the same physical base stations. Device **100** can be a battery-powered device and include a battery interface **142** for receiving one or more batteries **144**.

Processor **102** is coupled to and can interact with additional subsystems such as a Random Access Memory (RAM) **108**; a memory **110**, such as a hard drive, CD, DVD, flash memory, or a similar storage device; one or more actuators **120**; one or more force sensors **122**; an auxiliary input/output (I/O) subsystem **124**; a data port **126**; a speaker **128**; a microphone **130**; short-range communications subsystem **132**; other device subsystems **134**; and an input device such as touchscreen **118**.

Touchscreen **118** includes a display **112** with a touch-active overlay **114** connected to a controller **116**. User interaction with a graphical user interface (GUI), such as a virtual keyboard rendered on display **112**, is performed through touch-active overlay **114**. Processor **102** interacts with touch-active overlay **114** via controller **116**. Input, such as text, symbols, images, and other items are displayed on display **112** of touchscreen **118** via processor **102**. For example, text characters are inputted when the user touches the touchscreen at a location associated with said character. In other embodiments, a keyboard enables input to the device using a set of physical keys and communicates with processor **102** via auxiliary I/O subsystem **124**.

Touchscreen **118** is connected to and controlled by processor **102**. Accordingly, detection of a touch event and determining the location of the touch event can be performed by processor **102** of device **100**. A touch event includes, in some embodiments, a "tap" by a finger or stylus (a single touch of short duration on touchscreen **118**), a "swipe up" by a finger or stylus (a single touch of short duration on touchscreen **118** followed by a motion in an upwards duration, while still maintaining contact with touchscreen **118**), a "flick up" by a finger (similar to the swipe up, but with a more rapid motion upward), a "swipe to right" by a finger (similar to the swipe up, but in a different direction), a long press by finger or stylus, a press by a finger or stylus for a predetermined period of time, and the like. Each of these touch events initiates operations by the processor.

While specific embodiments of a touchscreen have been described, any suitable type of touchscreen for an electronic device can be used, including, but not limited to, a capacitive touchscreen, a resistive touchscreen, a surface acoustic wave (SAW) touchscreen, an embedded photo cell touchscreen, an infrared (IR) touchscreen, a strain gauge-based touchscreen, an optical imaging touchscreen, a dispersive signal technology touchscreen, an acoustic pulse recognition touchscreen, or a frustrated total internal reflection touchscreen. The type of touchscreen technology used in any given embodiment will depend on the electronic device and its particular application and demands.

Processor **102** can also interact with a positioning system **136** for determining the location of device **100**. The location can be determined in any number of ways, such as by a computer, by a Global Positioning System (GPS), either included or not included in electric device **100**, through a Wi-Fi network, or by having a location entered manually. The location can also be determined based on calendar entries.

In some embodiments, to identify a subscriber for network access, device **100** uses a Subscriber Identity Module or a Removable User Identity Module (SIM/RUIM) card **138** inserted into a SIM/RUIM interface **140** for communication with a network, such as network **150**. Alternatively, user identification information can be programmed into memory **110**.

Device **100** also includes an operating system **146** and programs **148** that are executed by processor **102** and are typically stored in memory **110**. In some embodiments, additional applications are loaded onto device **100** through network **150**, auxiliary I/O subsystem **124**, data port **126**, short-range communications subsystem **132**, or any other suitable subsystem.

A received signal such as a text message, an e-mail message, or web page download is processed by communication subsystem **104** and this processed information is then provided to processor **102**. Processor **102** processes the received signal for output to display **112**, to auxiliary I/O subsystem **124**, or a combination of both. A user can compose data items, for example e-mail messages, which can be transmitted over network **150** through communication subsystem **104**. For voice communications, the overall operation of device **100** is

similar. Speaker **128** outputs audible information converted from electrical signals, and microphone **130** converts audible information into electrical signals for processing.

FIG. **2** discloses an embodiment of touchscreen **201**. Touchscreen **201** displays a formatting bar **202** for performing operations such as undo, redo, and modifying text to be bolded, italicized, underlined, left-aligned, center-aligned, or right-aligned. In some embodiments formatting bar **202** has additional or different functionality; the above examples are not limiting. Touchscreen **201** further displays a cursor **203** to indicate where input entered by the user will be displayed on the screen. Touchscreen **201** further displays a textbox **204** that contains cursor **203** and input entered or accepted by the user.

In this example, touchscreen **201** also contains a preliminary input area, such as horizontal bar **210**. In some embodiments, horizontal bar **210** is divided up into at least three regions—a leftmost segment **211**, a center segment **212**, and a rightmost segment **213**. In some embodiments, each segment contains input entered by the user, input generated by processor **102**, or a combination of both. In some embodiments, touchscreen **201** also contains keyboard **214**, which contains at least one shift key **215**, at least one spacebar **216**, at least one enter/carriage return key **217**, and a set of character keys **218**.

FIGS. **3**A-**3**N are examples of displays used to explain methods for accepting input by a user in accordance with disclosed implementations. FIG. **3**A discloses a display on touchscreen **301**, as described with respect to FIG. **2**. When no input such as characters or text have been entered by the user, the leftmost and center segments **311** and **312** of horizontal bar **310** do not display any text. Rightmost segment **313** initially displays a "starter" text **320**, "Hello," as shown in FIG. **3**A.

As shown in the FIG. **3**B, when the user begins to enter characters, for example, the characters "P" and "l," the characters appear both as entered text **319** in textbox **304** and as a partial entry **321** in center segment **312**. An algorithm is used to add a partial complete prediction **322**, i.e. the character string "ease," to create current prediction **323**, i.e., the word "please." A future prediction **320** is further generated based on current prediction **323**. First, the device accepts an entry of "P" from the user, and modifies current prediction **323** and future prediction **320**, based on the predictions that are generated based on the entry of the letter "P." (This step is not shown in FIG. **3**B.) Then, the device accepts an entry of "l" from the user, and again modifies current prediction **323** and future prediction **320** based on the predictions that are generated from the partial word "Pl." This yields "Please" as current prediction **323** and "let" as future prediction **320**. In some embodiments, multiple predictions are generated for each of the center and rightmost segments, but only the most likely prediction for each segment is displayed to the user, to be explained later in greater detail.

FIG. **3**C discloses a further display on touchscreen **301**. As shown in FIG. **3**B, the user has entered "Pl" and the autocompletion algorithm completed the current prediction **323** with "ease" to generate "please," and further generated "let" as the most likely future prediction **320**. FIG. **3**C discloses touchscreen **301** can then receive a user input such as a "tap" or a "swipe to right" motion (as mentioned above) to confirm, that is, to accept, current prediction **323** and future prediction **320** as text input.

In some embodiments, when the user performs one of these motions starting on future prediction **320**, both current prediction **323** and future prediction **320** are confirmed by the system. Once current prediction **323** and future prediction **320** are confirmed, as shown in FIG. **3**D, the portion of current prediction **323** that is not already displayed in textbox **304** is displayed in textbox **304** to complete input text **319** as "Please." Future prediction **320** ("let") in FIG. **3**C is also added and displayed in textbox **304**. Future prediction **320** ("let") in FIG. **3**C in rightmost segment **313** is then moved to leftmost segment **311**. New predictions can then be generated for current prediction **323** ("us") and future prediction **320** ("know"), and then displayed in center segment **312** and rightmost segment **313**, respectively, as shown in FIG. **3**D.

FIG. **3**E discloses a further display of touchscreen **301**, showing operations when a user touches and holds down on a word in center segment **312**. In some embodiments, the operations in FIG. **3**E can occur when the user touches and drags in an upwards direction. A popup **324** is displayed to allow the user to select from a list of alternate predictions **324**A and **324**B. In some embodiments, these predictions are the predictions that were initially generated for the word in question but were not as likely, that is, not ranked as highly, as the most likely prediction. The number of alternate predictions shown can vary based on the algorithm used for autocompletion as well as a user-defined preference which enables upper and lower bounds on the number of displayed alternate predictions.

FIG. **3**F shows operations when the user taps on or, in embodiments where the user has touched and dragged in an upwards direction, released the touch on, one of alternate predictions **324**A. In FIG. **3**G, it can be seen that once the user taps to select alternate prediction **324**A in FIG. **3**F, and types "you," an updated current prediction **325** ("you'll") is displayed in center segment **312** and an updated future prediction **326** ("find") is displayed in rightmost segment **313**, based on the selection of alternate prediction **324**A ("when").

Once the user types the misspelled word "arive," as can be seen in FIG. **3**H, the user can indicate completion of that word, by, for example, pressing the spacebar, pressing the Enter key, pressing a key corresponding to signify the end of the word (for example but not limited to: a comma, a period, a hyphen, an at-sign (@), an exclamation point or mark, a semicolon), or swiping across the screen to the right.

As shown in FIG. **3**I, a spell check **327** can be performed on the misspelled word **328**. In some embodiments, if the word is misspelled, touchscreen **301** can highlight the word to signify that it is misspelled. For example, this highlighting can be made by coloring the text (for example, with the color red), coloring the segment containing the text, or the like. When a user touches and holds down on the misspelled word **328** as in FIG. **3**J, a popup **329** is displayed to allow the user to select from a list of alternate predictions **329**A and **329**B. In some embodiments, these predictions are generated for the word in question based on words as contained in a dictionary or list of properly spelled words, words contained in a list of commonly misspelled words, and the like. The number of alternate predictions shown can vary based on the algorithm used to complete the words or by a user-selected preference. FIG. **3**K shows that the user has tapped an alternate prediction **329**B.

In FIG. **3**L, it can be seen that as a result of the user tapping an alternate prediction **329**B in FIG. **3**K, both current prediction **330**, displayed as "and" in center segment **312** of FIG. **3**K, and future prediction **331**, displayed as "then" in rightmost segment **313** of FIG. **3**K are updated respectively to "this" and "Friday" based on the selection of the alternate prediction **329**B. FIG. **3**L shows that when a user touches and holds down on a word in rightmost segment **313**, a popup **332** is displayed to allow the user to select from a list of alternate predictions **332**A and **332**B. In some embodiments, these

predictions are the predictions that were previously generated for the rightmost segment but were not as likely as the most likely prediction. The number of alternate predictions shown can vary based on the algorithm used for autocompletion as well as a user-selected preference.

FIG. **3**M shows that the user has tapped alternate prediction **332**A. In FIG. **3**N, it can be seen that as a result of the user tapping alternate prediction **332**A, both current prediction **330** in center segment **312** and alternate prediction **332**A, as shown in FIGS. **3**L and **3**M, are accepted as text input by processor **102** and displayed in text box **304**. In some embodiments, processor **102** can determine that tapped prediction **332**A will end the sentence and thus can add a period to the end of alternate prediction **332**A. Processor **102** can also determine that other punctuation or symbols (such as the at-sign (@), comma, hyphen, exclamation point or mark, semicolon, colon, and the like) can end or begin a prediction.

FIG. **4**A is a flowchart illustrating an example method **400** for entering text input using predictions generated by user input, consistent with example embodiments disclosed herein. In this method, as the user enters various characters on keyboard **214**, predicted words will be displayed on center segment **212**, in accordance with associated rankings of predictions.

Method **400** begins at block **401**, where processor **102** generates and ranks predictions for a word being entered, and displays a prediction in the center segment **212** (FIG. **2**) based on an autocompletion algorithm. An example of an autocompletion algorithm is the SwiftKey algorithm released by TouchType, Ltd. This prediction generation step is based on previous words that a user has entered, previous words that a user has confirmed, previous words that a user has entered and confirmed, and characters that are currently displayed in the center segment but do not yet necessarily form a complete word.

Method **400** then proceeds to block **402**, where processor **102** generates and ranks predictions for a text unit to be displayed in rightmost segment **213** (FIG. **2**). In some embodiments, this prediction generation step is based on words previously entered by a user, words previously confirmed by a user, words that a user has previously entered and confirmed, characters that are currently displayed in the center segment, words that are displayed in the center segment, and predictions that have been generated for the word in the center segment.

Although embodiments disclosed herein illustrate words as text units, other types of text units can also be predicted, such as telephone numbers, acronyms, email addresses, etc.

In some embodiments, the predictions used in blocks **401** and **402** could be calculated using an autocompletion algorithm and contextual data. As used herein, an autocompletion algorithm (such as a predictive algorithm, program, or firmware) includes a set of instructions that when executed by a processor (for example, processor **102**), can be used to disambiguate, for example, received ambiguous text input. The autocompletion algorithm can provide various options, such as, for example, words, characters, phrases, acronyms, names, slang, colloquialisms, abbreviations, or any combination thereof, that a user might be contemplating. An autocompletion algorithm can also receive otherwise unambiguous text input and predict characters potentially contemplated by the user based on several factors, such as context, frequency of use, and others, as appreciated by those skilled in the field. An autocompletion algorithm can also receive as input only words which were previously entered by either a user or a device, and return words which are likely to follow those words.

Contextual data can be used in predicting the characters or text units intended by a user. In some embodiments, the electronic device is configured to rank nouns or adjectives higher based on the previous inputted characters or words. If the inputted characters and words are suggestive of a noun or adjective, for example, processor **102**, using the contextual data, can rank nouns or adjectives corresponding to what the user is typing higher. In an additional embodiment, a set of characters including adjective suffixes (such as "-ish" or "-ful"), phrases, plurals, or combinations thereof can also be generated and ranked. Contextual data can increase the likelihood that the higher ranked generated set of characters is the set of characters actually intended by a user. In some embodiments, contextual data can include information about which programs or applications are currently executing on processor **102**. For example, if an email application is being executed, then a set of characters associated with that user's email system, such as a set of characters representing entries from the user's contact list, can be placed higher in rank. N-grams, including unigrams, bigrams, trigrams, and the like, can be also used in the ranking of the sets of characters. Alternatively, geolocation of the electronic device or user can be used in the ranking process. If, for example, the electronic device recognizes that a user is located at his/her office, then sets of characters and words generally associated with work can be ranked higher. If, on the other hand, the device determines a user is at the beach, then sets of characters and words generally associated with the beach can be ranked higher.

Contextual data can also include information about, for example, words entered previously by the user, common words, words that would complete a known phrase, grammatical attributes of the set of confirmed/entered words (e.g. whether a noun, verb, adverb, or adjective should follow the current words or previous words), or the location of keys on the keyboard (for example, in order to determine likely corrections for potentially misspelled words), or any combination thereof. Contextual data can also include information about, for example, set of characters previously inputted by the user, grammatical attributes of the characters inputted in the input field (for example, whether a noun or a verb is needed as the next set of characters in a sentence), or any combination thereof. The rankings are used generated based on the likelihood of a particular prediction continuing or completing the phrase, sentence, or word that the user is entering using the keyboard. For example, if a user has typed "The quick brown fox jumped over the lazy," processor **102** can determine the ranking for "dog" to be higher than "cat." As another example, if a user has typed "anti," processor **102** can determine the ranking for "trust"—thus completing the word to be "antitrust"—to be higher than the ranking for "diluvian," depending upon contextual data. As another example, if a user has typed "unbelievale," processor **102** can determine the ranking for "unbelievable" to be higher than any other possibility, at least in part because of the possibility that the user did not press the "b" key hard enough. Using the contextual data, processor **102** can also determine whether an inputted character was incorrect. For example, processor **102** can determine that the inputted character was supposed to be an "o" instead of a "p", given the proximity of these characters on a QWERTY keyboard.

In some embodiments, the rankings used in blocks **401** and **402** are used to choose between multiple predictions, each of which comprises the same number of letters. For example, if the set of characters "cellphones" is ranked first in a list generated at block **402** after the letter "cel" is inputted, "cellphones" could be displayed in the center segment. Although "cellophane" contains the same number of characters and is

also one possible completion of "cel," the fact that the ranking of "cellphones" is higher than the ranking of "cellophane" would mean that "cellphones" would be the first displayed word in the center segment.

The method then proceeds to a displaying block **403**, where processor **102** displays the most likely prediction, that is, the prediction with the highest ranking, for the word in the center segment, and displays the most likely prediction for the word in the rightmost segment.

In some embodiments, candidate predictions can be generated by a probabilistic model. Models such as these will predict users' entries based on past entries by the user. A probabilistic model in this situation can utilize a database populated with word and n-gram frequencies. The data in this database can be used, at least initially, to "seed," or provide initial data, for the predictions. This data can be used when, for example, not enough text has been entered by a user of the device.

In some embodiments, the system will optionally store up to a certain number of predictions in memory for use by the user. In such embodiments, a user will be able to select from among these predictions if the user does not wish to use the most likely prediction to complete his entry.

The method **400** then continues in FIG. **4**B at method **410**. In block **411**, processor **102** determines if the user has entered any characters. If so, processor **102**, in some embodiments, can then generate and rank new predictions that are at least partially based on previous words that a user has entered, previous words that a user has confirmed, previous words that a user has entered and confirmed, characters that the user just entered and are currently in the center segment, words that are present in the center segment, and predictions that have been generated for the word in the center segment. Processor **102** can then continue back to block **402** in FIG. **4**A, where processor **102** can generate and rank new predictions for the word in the rightmost block in the manner described as above.

If, however, the user is not currently entering new text, processor **102** can continue in FIG. **4**C at method **420**. In block **421**, processor **102** determines if the user has tapped the center segment, thus indicating the user's confirmation of the prediction in the center segment. As mentioned above, the motion of "tapping," "swiping," or "flicking" on a segment can occur using a finger, stylus, or any other item, system, or method for indicating a particular point or region on a touchscreen device.

If the user has tapped the center segment, processor **102** can then take a number of steps to confirm the words in the center segment. First, processor **102** can confirm the prediction in the center segment, block **421**A. Next, processor **102** can move the confirmed prediction in the center segment to the leftmost segment, block **421**B, thus signifying that the confirmed prediction is part of the "past" words to be used in generating and ranking new predictions, as set forth above. Next, processor **102** can move the unconfirmed prediction in the rightmost segment to the center segment, block **421**C. This last movement does not necessarily confirm the word in the center segment, because the user has not yet tapped the word. However, it will queue up the word into the center segment, giving the user the opportunity to confirm or modify the prediction as he chooses. After this step, because the word now in the center segment will have been generated based on the confirmed word now present in the leftmost segment, predictions for the word in the center segment will not need to be re-generated and ranked. Processor **102** can thus continue to block **402** in FIG. **4**A, in order to generate and rank predictions for the word in the rightmost segment alone. However, in some embodiments, processor **102** continues instead to block **401** in FIG. **4**A, in order to generate and rank predictions for the word in the center segment, before generating and ranking predictions for the word in the rightmost segment

If the user has not tapped the center segment, then in block **422**, processor **102** determines if the user has tapped the rightmost segment, thus indicating the user's confirmation of the predictions in the rightmost segment and the center segment. As mentioned above, the motion of "tapping" on a segment can occur using a finger, stylus, or any other item, system, or method for indicating a particular point or region on a touchscreen device.

If the user has tapped the rightmost segment, processor **102** can then take a number of steps to confirm the words in the center and rightmost segments. First, processor **102** can confirm the prediction in the rightmost segment, block **422**A. Next, processor **102** can confirm the prediction in the center segment, block **422**A. Processor **102** confirms the prediction in the center segment because the user is confirming the prediction in the rightmost segment, which has been generated using the prediction present in the center segment. Next, processor **102** can move the confirmed prediction in the rightmost segment to the leftmost segment, block **422**B, thus signifying that the confirmed predictions that were originally in the rightmost segment and the center segment are part of the "past" words to be used in generating and ranking new predictions, as set forth above. Processor **102** then continues to block **401** in FIG. **4**A, in order to generate and rank new predictions for the word in the center segment before generating and ranking predictions for the word in the rightmost segment.

If, however, the user has not tapped on the center segment or the rightmost segment (following the "No" direction from block **422**), processor **102** can continue in FIG. **4**D at method **430**. In block **431**, processor **102** can determine whether the user has touched and held down on the center segment. In some embodiments, processor **102** can determine whether a user has performed a touch-and-drag motion on the center segment. As mentioned above, the event of touching and holding on the center segment can occur using a finger, stylus, etc. If the user has touched and held down on the center segment, processor **102** can then take a number of steps to assist the user in confirming a word in the center segment. First, processor **102** can display above the center segment a number of the predictions that have been generated and ranked for the center segment, block **431**A. In some embodiments, the number of predictions listed will be limited to a specific upper bound, for example, three. However, in other embodiments, the number of predictions displayed to the user will only be limited by the number of predictions generated for the center segment. The user can then select a word, for example, by tapping a word, block **431**B. In embodiments where a user has employed a touch-and-drag motion on the center segment, the user can select a word by releasing his touch while still touching the word. If the user selects a current prediction, block **431**C, processor **102** confirms the word presently in the center segment.

If, on the other hand, the user selects another prediction, for example one from a list of predictions displayed above the center segment, then processor **102** can confirm the selected prediction as the word in the center segment, as in block **431**D. Whether the user confirms the prediction currently displayed in the center segment, or another prediction, processor **102** can then proceed to block **431**E, where the now-confirmed word in the center segment can be moved to the leftmost segment. Next, processor **102** can move the unconfirmed prediction in the rightmost segment to the center segment, block **431**F. This last movement does not necessarily

confirm the word now displayed in the center segment because the user has not tapped the word. However, it will place the word into the center segment, giving the user the opportunity to confirm or modify the prediction as he chooses.

After this step, because the word now in the center segment will have been generated based on the confirmed word now present in the leftmost segment, predictions for the word in the center segment will not need to be re-generated and ranked. Processor **102** thus continues to block **402** in FIG. **4**A, in order to generate and rank predictions for the word in the rightmost segment alone. However, in some embodiments, processor **102** would continue instead to block **401** in FIG. **4**A, in order to generate and rank predictions for the word in the center segment, before generating and ranking predictions for the word in the rightmost segment.

If the user has not touched and held down on the center segment, or has touched and held down on the center segment but did not select a prediction, then in block **432**, processor **102** determines if the user has touched and held down on the rightmost segment. In some embodiments, processor **102** can determine whether a user has performed a touch-and-drag motion on the rightmost segment. As mentioned above, the event of touching and holding on the center segment can occur using a finger, stylus, or any other item, system, or method for indicating a particular point or region on a touch-screen device.

If the user has touched and held down on the rightmost segment, processor **102** can then take a number of steps to assist the user in confirming the words in the center segment and the rightmost segment. First, processor **102** can display a number of the predictions above the rightmost segment that have been generated and ranked for the rightmost segment, as in block **432**A. In some embodiments, the number of predictions listed will be limited to a specific upper bound, for example, three. However, in some embodiments, the number of predictions displayed to the user will only be limited by the number of predictions generated for the center segment. The user then selects a word, block **432**B, by, for example, tapping the word. In embodiments where a user has employed a touch-and-drag motion on the center segment, the user can select a word by releasing his touch while still touching the word. If the user selects a current prediction, block **432**C, processor **102** can confirm the word presently in the rightmost segment.

If, on the other hand, the user selects another prediction, for example one from a list of predictions displayed above the rightmost segment, then processor **102** can confirm the another prediction as the word in the rightmost segment, block **432**D. Whether the user chooses the current prediction for the rightmost segment or another prediction for the rightmost segment, processor **102** can then proceed to block **432**E, where the word in the center segment is also confirmed. Next, processor **102** can move the confirmed prediction in the rightmost segment to the leftmost segment, block **432**F.

After this step, processor **102** thus continues to block **401** in FIG. **4**A, in order to generate and rank predictions for the word in the center segment, before generating and ranking predictions for the word in the rightmost segment as in block **402** of FIG. **4**A.

If, however, the user has not touched and held on the center segment or on the rightmost segment, or has touched and held down on the rightmost segment but did not select a prediction, processor **102** can continue in FIG. **4**E at method **440**. This example method enables processor **102** to determine whether the user's entry in the center segment is spelled correctly. In block **441**, processor **102** can determine whether the user has provided input indicating the end of a word, by, for example, entering a "space" (by pressing the spacebar), a carriage return (by pressing the Enter key), punctuation signifying the end of a word (for example but not limited to: a comma, a period, a hyphen, an "at" sign (@), an exclamation point or mark, a semicolon), or has swiped across the screen to the right. If processor **102** determines that the user has not performed one of these actions, processor **102** can move forward to block **401** in FIG. **4**A.

If processor **102** determines that the user has performed one of these actions signifying the end of entering a word, the process continues in block **442**. In block **442**, processor **102** confirms the word in the center segment and moves it to the leftmost segment. Processor **102** can then continue to block **443** where processor **102** can determine whether the just-confirmed word in the leftmost segment is spelled correctly. This determination can be made using, for example, a dictionary, a list of past words entered by the user, a list of custom words entered by the user, or an autocompletion algorithm. If processor **102** determines that the word is in fact spelled correctly, processor **102** can continue to block **444**, where the prediction in the rightmost segment is moved to the center segment. Processor **102** can then continue to block **401** in FIG. **4**A, in order to generate and rank new predictions for the center and rightmost segments.

If, however, processor **102** determines that the word in the leftmost segment is not spelled correctly, processor **102** can then move to block **445** where the word in the leftmost segment is highlighted in order to signify that the word is misspelled. For example, this highlighting can be made using coloring of the text, coloring of the segment containing the text, or the like. Processor **102** then can proceed to block **446**.

In block **446**, processor **102** determines if the user has touched and held on the leftmost segment. If the user has not touched and held on the leftmost segment, and either begins typing again or taps the misspelled word, processor **102** can proceed back to block **401** in FIG. **4**A to continue processing using the misspelled word as part of the words that have been entered and are used to generate and rank new predictions, as described above ad in FIG. **4**A.

If, however, the user has touched and held down on the leftmost segment, processor **102** can take a number of steps to assist the user in selecting a word with which to replace the misspelled word. First, processor **102** can show, above the leftmost segment, a number of the predictions that have been generated and ranked for the leftmost segment, block **447**. These predictions can be based on an autocompletion algorithm. In some embodiments, the letters that make up the misspelled word are used by an autocorrect algorithm to determine what the user wanted to type based on letter proximity on the keyboard or on past misspellings. In some embodiments, the number of predictions listed will be limited to a specific upper bound, for example, three. However, in some embodiments, the number of predictions displayed to the user above the leftmost segment will only be limited by the number of predictions generated for the center segment.

The user then selects a word, block **448**. If the user chooses to not select a word and instead begins typing again, processor **102** can proceed back to block **401** in FIG. **4**A to continue processing using the misspelled word as part of the words that have been entered and are used to generate and rank new predictions. Similarly, if the user selects the original misspelled word, processor **102** can proceed back to block **401** in FIG. **4**A to continue processing using the misspelled word as part of the words that have been entered and are used to generate and rank new predictions.

If, however, the user selects a properly-spelled prediction—for example, one from a list of predictions displayed above the leftmost segment—then processor **102** can replace the word in the leftmost segment with the properly spelled prediction, block **449**, de-confirm the misspelled prediction which has been replaced, and confirm the correctly spelled word.

After this step, processor **102** thus continues to block **401** in FIG. **4**A, in order to generate and rank predictions for the word in the center segment before generating and ranking predictions for the word in the rightmost segment as in block **402** of FIG. **4**A.

FIGS. **5**A and **5**B disclose a flowchart of embodiments of the touchscreen which enable a user to swipe to confirm words that are predicted for the user, as described in part above.

FIG. **5**A discloses a flowchart implementing an action to confirm a successful prediction, when the user touches down on the center segment, swipes across the touchscreen, and holds down in place, as in block **501**A. Processor **102** can then start a timer, block **502**A. The timer is implemented, for example, to test a condition every 1,000 milliseconds. The timer is used to meter the confirming of words, so that the system will not confirm too many words in too short of a time. In some embodiments, the period defined by the timer is directly proportional to the distance between where the user is holding down on the touchscreen and the edge of the device. Thus, when the user is holding down at a point very close to the edge of the device, the period will be short; conversely, when the user is holding down at a point not as close to the edge of the device, the period will be longer. The relation between the period length, and the distance between the touchscreen and point of contact, can be in a linear relationship (i.e. the period length decreases at an even rate as the point of contact gets closer to the edge), an exponential relationship (i.e. the period length decreases exponentially as the point of contact gets closer to the edge), a logarithmic relationship (i.e. the period length decreases at a logarithmic rate as the point of contact gets closer to the edge), or any other similar relationship.

When the period expires, processor **102** continues to block **503**A and determines whether the user is still holding down on the screen. If not, processor **102** can then continue forward to block **501**B in FIG. **5**B for further processing.

If, however, the user is still holding down on the screen, processor **102** can then continue to block **504**A, where processor **102** will confirm the word in the center segment. Processor **102** can then continue to block **506**A, where the word in the center segment is moved to the leftmost segment. Processor **102** can then continue to block **507**A, where the word in the rightmost segment can be moved to the center segment. In some embodiments, this word is not confirmed upon moving to the center segment; the user's motion is taken to indicate that he wishes to only confirm the word originally in the center segment. However, in some embodiments, the word newly moved to the center segment can be confirmed as well.

After the processing in block **507**A, new predictions are generated and ranked for the word in the center segment in block **508**A. This generation and ranking is, in some embodiments, performed in substantially the same manner as in block **401** in FIG. **4**A. Next, processor **102** proceeds to block **509**A, in order to generate and rank new predictions for the word in the rightmost segment. This generation and ranking, in some embodiments, is performed substantially the same manner as in block **402** in FIG. **4**B. Processor **102** can then proceed to block **510**A, where the most likely predictions for the words in the center segment and the rightmost segment are displayed in their respective segments. Finally, processor **102** can then proceed to block **502**A to begin the timer again.

FIG. **5**B discloses a flowchart for use when the user touches down on the rightmost segment, swipes across the touchscreen, and holds down in place, block **501**B. Processor **102** can then start a timer, block **502**B, the operation of the timer as described above with regard to FIG. **5**A.

When the period of the timer expires, processor **102** continues to block **503**B and determines whether the user is still holding down on the screen. If not, processor **102** can then continue back to block **401** in FIG. **4**A for re-generation and ranking of predictions.

If, however, the user is still holding down on the screen, processor **102** can then continue to block **504**B, where processor **102** will confirm the word in the center segment. Processor **102** in this embodiment can then continue to block **505**B, where processor **102** will confirm the word in the rightmost segment as well. Processor **102** can then continue to block **506**B, where the word in the center segment is moved to the leftmost segment. Processor **102** can then continue to block **507**B, where the word in the rightmost segment can be moved to the center segment.

After the processing in block **507**B, new predictions are generated and ranked for the word in the center segment in block **508**B. This generation and ranking is, in some embodiments, performed in substantially the same manner as in block **401** in FIG. **4**A. Next, processor **102** proceeds to block **509**B, in order to generate and rank new predictions for the word in the rightmost segment. This generation and ranking, in some embodiments, is performed substantially the same manner as in block **402** in FIG. **4**B. Processor **102** can then proceed to block **510**B, where the most likely predictions for the words in the center segment and the rightmost segment are displayed in their respective segments. Finally, processor **102** can then proceed to block **502**B to begin the timer again.

Use of the indefinite article "a" or "an" in the specification and the claims is meant to include one or more than one of the feature that it introduces, unless otherwise indicated.

Other embodiments will be apparent to those skilled in the art from consideration of the specification and practice disclosed herein. It is intended that the specification and examples be considered as examples only, with a true scope and spirit being indicated by the following claims.

What is claimed is:

1. A method for accepting text input on an electronic device, comprising:

displaying a first input string based on an input selection in a first field,

displaying a first candidate prediction formed by (1) a set of characters corresponding to input selections and (2) a proposed completion to follow the set of characters in a second field, wherein the proposed completion is generated by a predictive algorithm using at least one of the first input string or the set of characters corresponding to input selections,

subsequent to the first candidate prediction, generating a second candidate prediction using a predictive algorithm that predicts subsequent candidates based on the first candidate prediction, and

displaying the second candidate prediction in a third field.

2. The method of claim **1**, further comprising:

generating, by the predictive algorithm, multiple first and second candidate predictions; and

ranking the multiple first and second candidate predictions based on a plurality of ranking criteria;

wherein displaying the first candidate prediction and second candidate prediction is based at least in part on the plurality of ranking criteria.

3. The method of claim **1**, further comprising:

receiving input selecting one of the first candidate prediction or the second candidate prediction.

4. The method of claim **3**, further comprising:

responsive to input selecting the first candidate prediction,

displaying the first candidate prediction in the first field,

displaying the second candidate prediction in the second field, and

generating, by the predictive algorithm, multiple candidate predictions for the third field; and

responsive to input selecting the second candidate prediction,

displaying the second candidate prediction in the first field,

generating, by the predictive algorithm, multiple candidate predictions for each of the second and third fields.

5. The method of claim **3**, wherein the input selecting one of the first candidate prediction or the second candidate prediction comprises one of a tap on the accepted prediction, a swipe across the accepted prediction, or the input of a punctuation key.

6. The method of claim **5**, further comprising:

responsive to input selecting the first candidate prediction, performing a spell-check on the first candidate prediction; and

if the spell-check determines that the first candidate prediction is misspelled,

displaying alternate predictions for the first candidate prediction, and

receiving input selecting an alternate prediction in place of the first candidate prediction.

7. The method of claim **1**, further comprising:

displaying additional predictions for a prediction or an input string in an area vertically aligned with the prediction or input string, respectively.

8. The method of claim **1**, wherein:

the set of fields comprises a horizontal bar; and

the first, second, and third fields respectfully comprise left, center, and, right segments of the horizontal bar.

9. An electronic device comprising:

a display, and

a processor configured to:

display a first input string based on an input selection in a first field,

display a first candidate prediction formed by (1) a set of characters corresponding to input selections and (2) a proposed completion to follow the set of characters in a second field, wherein the proposed completion is generated by a predictive algorithm using at least one of the first input string or the set of characters corresponding to input selections,

subsequent to the first candidate prediction, generat a second candidate prediction using a predictive algorithm that predicts subsequent candidates based on the first candidate prediction, and

display the second candidate prediction in a third field.

10. The device of claim **9**, wherein the processor is further configured to:

generate, by the predictive algorithm, multiple first and second candidate predictions;

rank the multiple first and second candidate predictions based on a plurality of ranking criteria; and

display the first candidate prediction and second candidate prediction based at least in part on the plurality of ranking criteria.

11. The device of claim **9**, wherein processor is further configured to receive input selecting one of the first candidate prediction or the second candidate prediction.

12. The device of claim **11**, wherein the processor is further configured to:

responsive to input selecting the first candidate prediction,

display the first candidate prediction in the first field,

display the second candidate prediction in the second field, and

generate, by the predictive algorithm, multiple candidate predictions for the third field; and

responsive to input selecting the second candidate prediction,

display the second candidate prediction in the first field,

generate, by the predictive algorithm, multiple candidate predictions for each of the second and third fields.

13. The device of claim **11**, wherein the input selecting one of the first candidate prediction or the second candidate prediction comprises one of a tap on the accepted prediction, a swipe across the accepted prediction, or the input of a punctuation key.

14. The device of claim **13**, wherein the processor is further configured to:

responsive to input selecting the first candidate prediction, perform a spell-check on the first candidate prediction; and

if the spell-check determines that the first candidate prediction is misspelled,

display alternate predictions for the first candidate prediction, and

receive input selecting an alternate prediction in place of the first candidate prediction.

15. The device of claim **9**, wherein the processor is further configured to:

display additional predictions for a prediction or an input string in an area vertically aligned with the prediction or input string, respectively.

16. The device of claim **9**, wherein

the set of fields comprises a horizontal bar; and

the first, second, and third fields respectfully comprise left, center, and, right segments of the horizontal bar.

17. A method for accepting text input on an electronic device, comprising:

displaying a preliminary input area on a display, the preliminary input area comprising first, second, and third regions;

displaying a text box on the display;

receiving character entries via a keyboard;

displaying the character entries in the first region and the text box;

generating candidate predictions for a first text unit based on the character entries;

ranking the candidate predictions for the first text unit, based on a first plurality of criteria;

displaying, in the first region, one of the candidate predictions of the first text unit as an initial prediction of the first text unit, based on the rankings of the candidate predictions for the first text unit;

generating first predictions for the second text unit based on the candidate predictions for the first text unit, wherein first predictions for the second text unit are generated by a predictive algorithm that predicts subsequent text units based on preceding text units;

ranking the first predictions for the second text unit based on a second plurality of criteria;

displaying, in the second region, one of the first predictions of the second text unit, based on the rankings of the first predictions for the second text unit;

receiving user input to accept the initial prediction of the first text unit displayed in the first region;

displaying the accepted initial prediction in the third region;

displaying, in the first region, the prediction displayed in the second region, as the current prediction of the first text unit;

generating second predictions for the second text unit based on the current prediction of the first text unit;

ranking the second predictions for the second text unit based on a third plurality of criteria;

displaying, in the second region, one of the second predictions of the second text unit, based on the rankings of the second predictions for the second text unit; and

displaying the accepted initial prediction in the text box.

18. The method of claim **17**, wherein the candidate predictions for the first text unit are based on the character entries and candidate predictions that have been previously accepted.

19. The method of claim **17**, further comprising:

displaying additional candidate predictions for the first text unit in an area vertically aligned with the displayed one of the candidate predictions for the first text unit.

20. The method of claim **17**, wherein the user input to accept the initial prediction of the first text unit displayed in the first region comprises one of a tap on the initial prediction, a swipe across the initial prediction, or a punctuation key being pressed.

21. The method of claim **20**, further comprising:

upon receiving the user input to accept the initial prediction of the first text unit displayed in the first region, performing a spell-check on the initial prediction; and

if the spell-check determines that the initial prediction of the first text unit displayed in the first region is misspelled:

displaying alternate predictions for the initial prediction of the first text unit displayed in the first region; and

receiving user input to accept an alternate prediction of the first text unit displayed in the first region.

22. The method of claim **17**, wherein:

the remaining input area comprises a horizontal bar; and

the first, second, and third regions respectfully comprise center, right, and left segments of the horizontal bar.

23. An electronic device comprising:

a display, and

a processor configured to:

display a preliminary input area on the display, the preliminary input area comprising first, second, and third regions;

display a text box on the display;

receive character entries via a keyboard;

display the character entries in the first region and the text box;

generate candidate predictions for a first text unit based on the character entries;

rank the candidate predictions for the first text unit, based on a first plurality of criteria;

display, in the first region, one of the candidate predictions of the first text unit as an initial prediction of the first text unit, based on the rankings of the candidate predictions for the first text unit;

generate first predictions for the second text unit based on the candidate predictions for the first text unit, wherein first predictions for the second text unit are generated by a predictive algorithm that predicts subsequent text units based on preceding text units;

rank the first predictions for the second text unit based on a second plurality of criteria;

display, in the second region, one of the first predictions of the second text unit, based on the rankings of the first predictions for the second text unit;

receive user input to accept the initial prediction of the first text unit displayed in the first region;

display the accepted initial prediction in the third region;

display, in the first region, the prediction displayed in the second region, as the current prediction of the first text unit;

generate second predictions for the second text unit based on the current prediction of the first text unit;

rank the second predictions for the second text unit based on a third plurality of criteria;

display, in the second region, one of the second predictions of the second text unit, based on the rankings of the second predictions for the second text unit; and

display the accepted initial prediction in the text box.

24. The device of claim **23**, wherein the candidate predictions for the first text unit are based on the character entries and candidate predictions that have been previously accepted.

25. The device of claim **23**, wherein the processor is further configured to:

display additional predictions for the first text unit in an area vertically aligned with the displayed one of the candidate predictions for the first text unit.

26. The device of claim **23**, wherein the user input to accept the initial prediction of the first text unit displayed in the first region comprises one of a tap on the initial prediction, a swipe across the initial prediction, or a punctuation key being pressed.

27. The device of claim **26**, wherein the processor is further configured to:

receive the user input to accept the initial prediction of the first text unit displayed in the first region; and

perform a spell-check on the initial prediction;

if the spell-check determines that the initial prediction of the first text unit displayed in the first region is misspelled:

display alternate predictions for the initial prediction of the first text unit displayed in the first region; and

receive user input to accept an alternate prediction of the first text unit displayed in the first region.

28. The method of claim **23**, wherein:

the remaining input area comprises a horizontal bar; and

the first, second, and third regions respectfully comprise center, right, and left segments of the horizontal bar.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.	: 9,223,497 B2
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DATED	: December 29, 2015
INVENTOR(S)	: Jerome Pasquero, Donald Somerset McCulloch Mckenzie and Jason Tyler Griffin

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 15, Line 57, In Claim 9, delete "generat" and insert -- generate --, therefor.

Column 18, Line 55, In Claim 28, delete "method" and insert -- device --, therefor.

Signed and Sealed this
Twelfth Day of July, 2016

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office